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Bayesian Reasoning's Power to Challenge Religion and Empirically Justify Atheism

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Abstract: *Bayes' Theorem is a simple mathematical equation that can model every empirical argument. Accordingly, once understood it can be used to analyze, criticize, or improve any argument in matters of fact. By extension, it can substantially improve an overall argument for atheism (here meaning the belief that supernatural gods probably do not exist) by revealing that god apologetics generally operates through the omission of evidence, and how every argument for there being a god becomes an argument against there being a god once you reintroduce all the pertinent evidence that the original argument left out. This revelation further reveals that god apologetics generally operates through the omission of evidence. This paper demonstrates these propositions by illustrating their application with examples.*

Keywords: Bayes' Theorem, Bayesian Reasoning, Atheism, Logic, Apologetics

Introduction

Bayes' Theorem (discovered by Thomas Bayes before his death in 1761 and developed by Pierre-Simon Laplace in 1774) is an equation that models all correct empirical reasoning. Take any argument for any conclusion about any question of fact, and Bayes' Theorem describes everything going on in it that decides how likely that conclusion really is. Once you understand this, it is like understanding how a car's engine works: you can pop the hood on any argument and see what is wrong with it or what it would take to fix it and make it work. This follows whether it is an argument you are making to others to persuade or convince them of some matter of fact, or an argument you are making to yourself in developing your own conclusions and beliefs, or an argument someone else is making or has made that you are being confronted or challenged with.[1]

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[1] Carrier, *Proving History*, 106–14; Bovens and Hartmann, *Bayesian Epistemology*; Zenker, *Bayesian Argumentation*; Levitin, *Field Guide*; Tucker, *Knowledge*; Jaynes, *Probability Theory*; and Hunter, *Political-Military Applications.*

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Most reasoners (especially atheists) will be more familiar with various forms of straightforward, deductive, syllogistic reasoning; for example, "if *p* is *q*, and *q* is *x*, then *p* is *x*," or "if *q* when *p*, and there is no *q*, then there is no *p*," etc. But that is of no direct use in answering questions of fact. Deductive logic can tell us what must be the case "if" something else is the case; but what you usually want to know is whether that "something else" is the case. And deductive logic cannot answer that question—or at least, once you deconstruct the convoluted syllogism you would need to do that, you will end up discovering exactly what Bayes and Laplace did hundreds of years ago. The principal problem is that, excepting basic Cartesian facts about present human experience, all matters of fact can only ever be known to a probability, and simple deductive syllogisms do not validly induce a probability. But a Bayesian syllogism does.

This article will explain Bayes' Theorem in the simplest terms possible and illustrate how it can be used to analyze arguments generally, and then it will show how this knowledge can be used to transform any argument for the existence of a supernatural god (meaning any sentient being powerful enough to create or alter our universe who is not just another evolved or constructed physical machine in the way humans are) into an argument against the existence of that god, by merely reintroducing evidence that the original argument left out, thus illustrating that all reasons given for believing that such a god exists depend on the omission of evidence.

Bayes' Theorem in a Nutshell

Bayes' Theorem can be formulated mathematically in many different ways, but they all reduce to each other and are therefore interchangeable with suitable translation. But the formula most readily understandable to most people relies on the human brain's more natural capacity to understand probability in terms of "odds" or "frequencies," whereby the chance something will turn out to be true might be, for example, "2 to 1" or "2 in 3" and the like.[2] The expression "2 to 1" means the same thing as "2 in 3" and translates to a probability of roughly 67%; likewise, "1 to 99" means "1 in 100" and translates to a probability of 1%, and "4 to 7,000" means "4 in 7,004" and translates to a probability of roughly 0.057%, or about a seventeenth of a percent.[3] Human reasoners more readily grasp concepts like "twice as likely" or "twelve times less likely" than complex decimal percentages such as 66.67% or 8.33%.[4]

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[2] On this disposition: Weber, Binder, and Kraus, "Why Can Only 24%?"

[3] Numbers in quotation marks are being given here as numerals to facilitate the reader's comprehension of the mathematical points to be made.

When represented in its odds form, Bayes' Theorem can be fully represented with the colloquial formula:

$$\text{Final Odds} = \text{Prior Odds} \times \text{Evidential Odds}$$

Where here "Final Odds" means simply the odds that your claim or conclusion is true; the "Prior Odds" means what those odds would usually be, based on past experience and before considering new or specific evidence in this particular case; and the "Evidential Odds" refers to the relative likelihood that this new or specific evidence would exist on either your claim being true, or your claim being false (in which case some other conclusion must be true).

For example, for the Prior Odds, one would state how often similar claims have turned out to be true in the past. What has *usually* turned out to be the case when such claims are made? And here, one might take into account the frequency of past claims being true given a particular source or circumstance (e.g., "more reliable" sources and circumstances will entail higher frequencies of certain kinds of claims that have turned out to be true). Given all that, how often have such claims turned out to be true? Is it "1 in 10" times? Or "1 out of 2" times? Or "99 out of 100" times? Stated in terms of the odds, "1 in 10" would be 1/9, since the 1 and the 9 must account for every possibility, and 1 + 9 = 10. Accordingly, "1 in 2" is 1/1, "99 out of 100" is 99/1, and so on.

Many arguments depend on explicit or implicit assumptions regarding this "Prior Odds" ratio. Indeed, this is always a stated or implied premise in every argument in matters of fact. It is, therefore, important to ascertain which assumption regarding the "Prior Odds" ratio the presenter of an argument is making (even if that presenter is you, and you are only reasoning with yourself), and then to examine whether that assumption is sound, given all that humankind knows to date. As with the premises in any other form of logic, an unsound assumption regarding the Prior Odds will have to be corrected in order to produce a sound conclusion.

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[4] For readers who need more mathematical explanation, the odds that some claim or conclusion h is true are always the ratio of the probabilities that h is or is not true, e.g., if there is a 95% chance your conclusion is true then there is, by definition, a 5% chance it is not true, since its being true or not true sum all objective possibilities, and therefore must sum to 100%; and the ratio of 95/5 produces an "odds" on the claim being true that can be represented fractionally as 19/1 (as 95/5 = 19/1).

Then, for the Evidential Odds, one would state how much more (or less) likely is the entire collection of all the available evidence there is to present for or against the claim or conclusion being argued, which requires estimating two things: first, how likely all the available evidence is if the claim is true; and, second, how likely all that same evidence is if the claim is false. These two likelihoods then stand in ratio to each other to establish how strongly the total body of evidence argues for or against the claim. Is all that evidence ten times more likely if that claim is true than if it is false? Or two times less likely? Or only slightly less likely? Or equally likely? Etc. One would then write this out as a statement of relative odds—the odds of the evidence "based on the claim being true rather than false." So, evidence that is ten times more likely if the claim is true would give us an evidential odds of 10/1, because "10" is ten times "1"; if it were two times *less* likely, then it would be 1/2, because "2" is two times one, and in this case, the evidence is twice as likely if the claim is *false* than if it is true. Likewise, if one said the odds on the evidence were 99/100, true to false, then one would be saying the relative odds were 99/100, which is so close to 100/100 and thus 1/1, as to make little difference in practice. Whereas if all the evidence we have is equally expected whether the claim or conclusion is true or false, then the "evidential odds" are indeed 1/1.

Just Three Numbers

This is all the math you need to analyze an argument. And this means that all arguments about matters of fact are always arguments over just three numbers: the prior probability of a claim (how usually do claims like that turn out to be true; how typical is it), the probability of the evidence if that claim is true, and the probability of that same evidence if that claim is false. Most commonly, arguments surround the Evidential Odds: someone is asserting "the evidence" is so much more likely based on their claim being true than based on its being false that their claim "must" be true, i.e., the Final Odds have to be so good that their claim *must* have a high enough probability to believe it is true. And this is just another estimate of "usual frequency" (how often does "that kind of evidence" result from "that kind of cause," and how often without it). For example, starting out with equal Prior Odds—mathematically, 1/1, or one to one—someone might then claim that the evidence they are pointing to is twenty times more likely to be there (20/1) if their conclusion is correct than if it is not (and "something else" caused all that evidence to exist instead). Which amounts to asserting only "a twentieth of the time" would such evidence still come about in the absence of that claimed cause. And since it is incontrovertible that 1/1 × 20/1 = 20/1 in Final Odds, this argument would entail the conclusion is also twenty times more likely to be true than false. All one then need do is examine whether the premises are well-founded. *Is* that evidence "twenty" times more likely when that explanation is true than any other? *Are* the Prior Odds equal?

That assumption about prior probability is often a hidden premise. For example, if someone argues solely from the relative likelihood of the evidence, they are implicitly assuming the Prior Odds are even—that absent that evidence the claim is "50/50," or "just as likely" to be true as false. And if there are good reasons to doubt that such a claim has fully equal odds of being true before being presented the specific evidence referenced in the argument—if a vast database of *prior* evidence accumulated by humankind argues those odds do *not* "begin" equal in any argument today—then *that must be taken into account*, and the Prior Odds accordingly revised and included in the calculation of any Final Odds. Otherwise, the Final Odds will not be a soundly produced conclusion, but a conclusion depending on an untenable assumption, an assumption that essentially amounts to disregarding a great deal of pertinent evidence—leaving that evidence "out of account," as it were. But a sound conclusion cannot be reached with omitted-yet-available evidence. That evidence, therefore, must be reintroduced, and the effect of that reintroduction logically accounted for. In this case, "prior" evidence is usually referred to as "background knowledge" to distinguish it from the more limited selection of evidence being presented specifically to argue for or against the conclusion, which is thereby simply called "evidence" by abbreviation. But in a broader sense, it is all evidence, and it must all be accounted for to arrive at any sound conclusion.[5] A sound conclusion cannot be reached with omitted-yet-available evidence.

Imprecision and Uncertainty

To use Bayesian reasoning like this requires understanding other general principles of reasoning. One of which is the argument *a fortiori,* "from the stronger premise." Here this means using estimated probabilities that are so much higher or lower than needed that any correction toward a more accurate probability will only make the conclusion stronger. It is, thus, not necessary to know or to precisely prove *any* probability or odds in a Bayesian argument; all one needs to do is settle on any probability all sides agree is indisputable based on the available background understanding.

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[5] This is also mathematically *literally* the case: every Prior Odds is either actually or conceptually the Final Odds of a previous run (usually implicit) of the same Bayesian equation. "Background knowledge" is therefore really "prior evidence." Prior Odds therefore mathematically represent all human learning; and apart from thought experiments that counterfactually posit ignorance, arguments that ignore all human learning are unsound.

For example, I do not know the precise odds that a meteorite will destroy my house today. I could determine that from available background knowledge (such as data collected by NASA regarding the frequency-per-acre-day of destructive meteorite impacts on Earth). But I do not have to if I can proceed with any probability or odds *against* my expected conclusion that is, nevertheless, already obviously correct. If I am claiming that I need not worry about my home being destroyed by a meteorite today (and therefore I do not need to evacuate it), and that conclusion follows even with a much *higher* odds of an impact than I know to be actual, then my conclusion will follow *with even greater certainty* given any more accurate estimation of those odds. For example, it is indisputable that the real odds of a meteorite destroying my house today, whatever they are, are well above one in a thousand—because if they were not, I would have in my own personal background knowledge hundreds of friends and acquaintances who have lost their homes to meteorite impacts (since a daily rate of one in one thousand entails every home will be thus destroyed on average every three years or so). So, I can operate with the premise "the Prior Odds are higher than one in one thousand," and still know that the conclusion ("I need not evacuate my home today") is correct.

The utility of *a fortiori* reasoning eliminates any objection one might have to the impossibility or inaccessibility of mathematical precision in an argument; and this is the actual way everyone typically argues—most people are operating from implicit *a fortiori* assertions or assumptions regarding the Prior or Evidential Odds, almost all the time. That they never articulate these assumptions in precise numerical terms makes no difference. This is nevertheless what is going on in their heads. And we often don't even need to articulate numbers; usually it is enough to know that some probability is "more" than another, or "a lot more," and either way, *a fortiori*, it might not matter "by how much."

For example, that some collection of evidence is evidence "for" our claim being true requires only that the probability of that evidence be *higher* if our claim is true than on any other competing claim (or whatever competing claim we are comparing ours to); it does not matter "how much" higher. That would only matter insofar as we were asserting that that evidence is "very good" or "very strong" and the like (or the converse, that it is "very weak" or "not very compelling" and the like), but these assertions only entail declaring that whatever that difference in probabilities is, that it is nevertheless “large” (or, in the converse case, “small”). And as with the meteorite example, that claim can be known to be true without knowing any more precisely “how” large or small. If some collection of evidence is “very unlikely” on any other explanation than ours, and we can present “strong” evidence of that (as for example, the complete absence of frequently meteor-ravaged homes in our personal and investigative experience), we do not need to know anything more to support whatever conclusion follows. Mathematical logic is, therefore, in no way hindered by imprecision or uncertainty. One can simply include any needed imprecision or uncertainty in the math.

General Application: Common Principles of Reasoning

To see how this works in a general respect, consider some common tropes of argument—for example, that “extraordinary claims require extraordinary evidence.” Analyzed with the tool of Bayes’ Theorem, one can entirely model what this is saying: an “extraordinary claim” means any claim with an “extraordinarily low” Prior Odds. Because this amounts to saying that a claim is “extremely unusual,” and “extremely” is just a synonym of “extraordinarily,” and “unusual” is just a synonym of “infrequent,” and “infrequent” is just a synonym of “improbable.” And “improbable” translates to “low odds.” Bayes’ Theorem then explains *why* such claims require extraordinary evidence to believe them.

If a claim starts out with extraordinarily low Prior Odds, and anyone’s “belief” requires at least a minimally favorable “Final Odds” (any odds better than equal odds, or 1/1), then *only* an extraordinarily high Evidential Odds can warrant belief. This holds regardless of what precise definition is given to “extraordinary,” so long as one maintains the same definition in both cases. For example, if one defined “extraordinarily low odds” as one in one million (mathematically, 1/1,000,000), then one must define “extraordinarily high odds” as at least a million to one (mathematically 1,000,000/1). If a claim starts out a million to one against, then one needs evidence that is over a million to one in favor to overcome that obstacle. The demonstration follows:

$$1/1 = 1/1{,}000{,}000 \times 1{,}000{,}000/1$$

It is thus indisputable that *any* Evidential Odds *below* extraordinary can never warrant belief; such would always produce a Final Odds that favored the claim *being false*. Belief is, therefore, only warranted to the degree the evidence is *even more extraordinary* than the claim itself is improbable.

Of course, "merely" extraordinary evidence (evidence that has Evidential Odds exactly the inverse of the Prior Odds) only warrants perfectly equivocal agnosticism (a belief that the claim is just as likely to be false as true); but the intent behind the aphorism is that one must have *at least* evidence that extraordinary to overcome the conclusion that such a claim is probably false. Most people set a much higher bar for belief than merely "more probable than not" (thus accounting for the epistemic position of "agnosticism" in the particular sense of "the state of being insufficiently certain"), so evidence must be not merely as extraordinary as a claim is improbable, but *also* sufficiently strong *over and above* that to warrant actual confidence in a claim's truth—just as with ordinary claims. For example, if a person's threshold for belief is that a claim must be at least 99% certain to be true in order for them to "believe" it (as in, to confidently operate as if it is true), and so far as they know the claim is as likely to be true as false (before receiving any specific evidence regarding it), then that person needs evidence that is at least a hundred times more likely if the claim is true than if any other competing explanation of the evidence were instead true. That evidence, therefore, must have less than a 1% chance of existing on any other explanation; otherwise, by their own standards, they might still accept that it is likely but still have to reserve some doubts. But when a claim is extraordinary, the evidence required must *also* meet that *extraordinary* bar, and Bayes' Theorem explains why—while proving that one cannot "get around" this.

The same follows for the aphorism "absence of evidence is not necessarily evidence of absence." If we expect the evidence in question to be missing *regardless* of whether a claim regarding it is true, then the Evidential Odds are equal, an even 1/1. In that case, the evidence is as likely to be missing if the claim is true as when the claim is false. Ergo, the absence of this evidence is not evidence of absence. But if we *do not* expect that evidence to be missing, then the more unlikely it is that we would not have found it, and, therefore, the more unlikely the claim is to be true. For instance, if it were five times more likely that a certain court record would be missing if a claim about it were false than if it were true (in other words, that document is so expected to be there that its absence *is unusual*), then the Evidential Odds would be 1/5. If we had started with equal Prior Odds, we would end up with a Final Odds of 1/1 × 1/5 = 1/5. The claim is then five times more likely *to be false* than to be true. The absence of *this* evidence *is* evidence of absence. Bayes' Theorem, therefore, explains why, as well as *when*, an absence of evidence is evidence of absence, *and* how strong that absence is as evidence: it is simply a function of how unexpected—how unusual—its being missing happens to be, all things considered.

Similarly, Ockham's Razor states that simpler explanations tend to be more likely, which follows from the fact that explanations with excess components are always more improbable than explanations (should any be available) that do not require those components, or any other components that are as unlikely as those. Again, Bayes' Theorem explains why. When two explanations perform equally well (e.g., they explain all the same observations), an explanation that has more components "added to it" will always be the less probable, owing to the Law of Total Probability: unless the additions are fully 100% certain (meaning, they are logically necessary; as in, they cannot logically be false and thus have *no* probability of being false), they will each always have some probability less than 100%, which necessarily reduces the total probability of their conjunction (any two probabilities multiplied always produces a probability smaller than both). So, a theory that is otherwise identical but does not have those added elements cannot fail to be more likely. However, most of the time, Ockham's Razor is applied not to *identical* theories (with only things added or taken away), but quite different ones, which are nevertheless being compared with respect to their relative complexity, and that is where Bayes' Theorem comes in.

For example, if the Evidential Odds are against a claim—say, that 1/5 just considered earlier, where the evidence is five times more likely to be as we find it if the claim *is false* than if it were true—one might try to change that by "adding" more assumptions to your claim ("invisible ninjas hid all the evidence"). Then, of course, the missing evidence is entirely expected ("the ninjas got to it"), so its being missing is now as expected if the claim is false as if it were true (and thus 1/1, instead of 1/5, a significant improvement in the theory's ability to predict the evidence). But usually to do that, one would have to add improbable assumptions to their claim, as in this toy example: someone invented a new kind of ninja, which they have no evidence for; and these ninjas just happen to have a motive to hide this particular evidence; *and* that person invented their remarkable success at doing so—since it does not automatically follow that if they tried, they'd succeed. Even if each of those assumptions were as likely true as false (and therefore "50/50"), that would still mean your claim requires *a set* of assumptions that is very unlikely (the "ninjas" explanation requires three assumptions, each no more likely to be true than false, and 50% × 50% × 50% = 12.5%). If your Prior Odds had been equal ("50/50," i.e. 1/1), now upon adding these assumptions you have to multiply your explanation's prior probability by the *new* improbability you just added on. Because that same Law of Total Probability still applies.

So when we take this 12.5% in our toy "ninja" example, we take a 50% prior probability (where we had started) and now must multiply it by a 12.5% chance that all those assumptions you added are even true. Which gets you to 6.25% (0.50 × 0.125 = 0.0625). When you include the effect of this on the total odds, your theory's Prior Odds are no longer "50/50" but 6.25/93.75, which reduces to 1/15.[6] So you went from 1/1 to 1/15. It is now fifteen times more likely something *else* is causing the evidence than what you are proposing. You just made your theory *less* likely, in your misguided attempt to make it fit the evidence better than it actually does. By adding your unproven assumptions, you took a claim that started out 50% likely, and ended up with a claim that's barely 6% likely; and you also obtained no increase to that at all from the probability of the evidence. "As likely as not" has thus become fifteen times more likely *to be false*. And since all you "got back" for that trick was to bump the Evidential Odds up from 1/5 to 1/1 (the evidence is now just as likely on your new assumption-reinforced claim being true as on its being false), you actually went from 1/1 × 1/5 = 1/5, for a Final Odds of 5 to 1 against your claim (where you started), to 1/15 x 1/1, for a Final Odds of 15 to 1 against your claim. So indeed all you did was make your claim less likely. You did not rescue it from the evidence at all. "Added assumptions" usually make theories less, not more probable.

The example above shows how Bayes' Theorem explains the validity of Ockham's Razor, even when comparing otherwise disparate theories: the more assumptions one would have to add to increase the predictive success of an explanation or claim necessarily reduces the overall probability that the claim is true. Usually, when this tactic is employed apologetically rather than rationally, this effect of "adding assumptions" on the overall probability *is ignored*. Bayes' Theorem thus explains why doing that is logically invalid. The only time adding assumptions does not have this effect is when there is abundant independent evidence the assumptions are true (so that their probability is high) or when their addition increases the Evidential Odds more than it reduces the Prior Odds. For example, in what it can predict and explain, the Periodic Table far outperforms Aristotle's much simpler Four Element model in Evidential Odds—far more than its complexity would diminish its Prior Odds. And that is why we believe the former and not the latter, despite it being so much less simple.

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[6] For readers needing the mathematical reason: if a theory requires assumptions that reduce its prior probability to 6.25%, the prior probability that some other thing explains the evidence becomes 100% - 6.25% = 93.75%. The concurring odds ratio, therefore, becomes 6.25/93.75; and 6.25 goes into 93.75 fifteen times.

Specific Application: Godless Naturalism

Of all the worldviews and belief-systems compatible with atheism as a general conclusion, ontological naturalism currently enjoys the highest Final Odds (on the basis of the findings of all the sciences to date). And if *any* version of atheism is more probable than theism, then *atheism* is more probable than theism. Therefore, this article will continue with the simplifying assumption that atheism means “ontological naturalism” (as no other variety of atheism needs to be considered here to warrant the conclusion that “atheism” is more likely).

Basic Argument for Naturalism

The basic argument for naturalism runs as follows: after centuries of inquiry now, countless times, millions even, claims of the “God did it” or “It requires God” variety have turned out to be false; whereas claims like “Nature did it” or “It only requires Nature” have turned out to be true instead. The evidence overall has accumulated in only one direction: that minds require physical machinery (brains) and cannot exist or function disembodied; supernatural powers do not exist; there is no magic or miracle that has ever been verified as anything but a product of fakery or mistake; and so on. In other words, the presumption of naturalism is not, in fact, a *presumption*: it is a conclusion built on extensive evidence and experience.[7] Had the world been the other way around—had supernatural powers existed, gods existed, disembodied minds existed—we should likely have found evidence of it by now. That we have not means there is not likely to be any, which is exactly what we expect if those things do not exist at all. And any excuses one might invent to “explain this away” only make their claim *less* likely, not more so, per Ockham’s Razor as just explained. Conclusions to the contrary are now Extraordinary Claims, lacking even ordinary, much less extraordinary evidence. To the contrary, the profound absence of evidence now, after such meticulous and extensive investigation and observation over hundreds of years, is itself extraordinarily improbable—exactly the opposite of what is needed to vindicate supernaturalism, much less specifically theism (as previously defined).

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[7] For surveys of this fact of modern naturalism, see Carroll, *The Big Picture*; Bashour and Muller, *Contemporary Philosophical Naturalism*; Clark, *Blackwell Companion*; and Carrier, *Sense and Goodness*.

In Bayesian terms, the Prior Odds on theism are extraordinarily low. And this is not for arbitrary reasons of presumption. It is a consequence of a vast body of past evidence (the accumulated background knowledge of humankind). "God-causes" are not just extraordinarily rare in reliable observation; they are completely missing from reliable observation.[8] They are, therefore, not "usual" explanations in any subject of inquiry. They are, in fact, now the least likely explanation one could posit for anything.

Even the "rebuttal" that "god-causes" are evident in *non*-reliable observation (occasions in which real tests cannot be made of their authenticity) argues *against* the existence of god-causes rather than for them: all else being equal, it is improbable that this disparity would exist if gods exist (god-causes "appearing" precisely only ever in non-reliable observations, and conveniently never in reliable ones), whereas this disparity is exactly what we expect to observe if gods do not exist. Therefore, *this very observation* (the theist's own rebuttal) yields Evidential Odds favoring atheism against theism, not the other way around. Any effort to escape that logical consequence by "inventing excuses" for why gods deceptively ensure exactly this outcome (thereby intentionally making the world look exactly like a world with no gods in it) violates Ockham's Razor by requiring the addition of improbable assumptions (assumptions for whose truth no evidence exists, and thus no evidence exists to render them probable), which necessarily reduces the Prior Odds (as previously shown), while still not producing any Evidential Odds against atheism—because even such an excuse can only at best get this observed evidence to be *equally likely* on theism and atheism, not *more* likely on theism than atheism, which is what is needed to turn those odds around. So, this excuse *reduces* the overall probability of theism, thereby making *atheism* more probable—not less. As it happens, this same reasoning turns every argument for god against itself.

The Cosmological Argument

Consider the so-called Cosmological Argument. For example, "What begins to exist must always have a cause; the universe began to exist; therefore, the universe must have a cause; but without a universe only a god-cause can exist; therefore, a god caused the universe." This argument requires three premises no more likely to be true than false ("*everything* that begins requires a cause"; "there is a beginning to *everything* that exists"; and "only god-causes can exist apart from 'a universe'"). These assumptions are possibly even *less* likely to be true than false: many leading cosmological models involve no beginning to time, but since causes by definition precede effects in time, it does not seem plausible that time itself can be expected to have a cause; and based on all we know about what causes are necessary to produce thought and action, it is implausible that a disembodied mind with supernatural powers could exist and predate even time.[9] But even if we set those concerns aside and set these three assumptions at exactly 50% likely apiece (each "as likely true as not"), then the Prior Odds on "a god caused the universe" can then be no better than, again, 50% (initial odds) × 50% (first assumption) × 50% (second assumption) × 50% (third assumption) = 6.25%. Which leads us again to a mere 1/15 odds on the existence of a god. Thus, the Cosmological Argument, when subjected to the correct application of logic, is an argument for atheism: even if the remaining evidence is equally likely on atheism and theism (for an Evidential Odds of 1/1), we end up with 1/15 x 1/1 = 1/15, a Final Odds *against* god existing of *fifteen to one*: a god is the *least* likely explanation of our universe; not the most.

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[8] For examples of how Bayesian argumentation can demonstrate this for ancient Christianity, see Carrier, "Why the Resurrection is Unbelievable" 291–315 and "Christianity's Success Was Not Incredible," 53–74.

The response to this conundrum is to resort to some attempt to present evidence that is claimed to be unlikely *unless* a god was involved (and hopefully unlikely enough to overcome any prior odds against it). Most apologetics consists of such arguments, and these are as Bayesian as any other arguments are: the theist claims some evidence *e* is "less likely" on atheism than on theism, and therefore theism is more likely than atheism. Their own logic requires a Bayesian calculation: this disparity in the probabilities (the "expectedness" or "predictability") of the cited evidence (the Evidential Odds) must somehow produce a disparity in the probabilities of the conclusions (the Final Odds). Only Bayes' Theorem explains how this would do that. Which manner of argument one then discovers requires *assuming* the Prior Odds start out even. The rest of apologetics consists of resisting the consequences of contrary arguments (such as regarding the *low* prior probability of god-causes, as just analyzed; or regarding *contrary evidence* presented, such as in the case of the Argument from Evil, to be examined shortly).

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[9] Stenger, *Has Science Found God?*; Fodor, *Unreasonable Faith*, 12–151; and Pearce, *Did God Create the Universe?*

The Fine-Tuning Argument

The most obvious example of "evidence that is claimed to be unlikely," after critics dispatch the Cosmological Argument, is the Fine-Tuning Argument, which states that a universe can only produce life capable of contemplating these questions if its fundamental "physical constants" are so "finely tuned" as to defy any explanation but intentional design. This is a Bayesian argument. There are two competing hypotheses: the life-producing quality of this universe is a lucky coincidence, or else it was intelligently designed. The theist proposes that, stated simply thus, since the "god" hypothesis predicts the observation ("fine-tuning") with near 100% certainty, while the "luck" hypothesis requires an extraordinarily improbable occurrence, the disparity in those two hypotheses (the Evidential Odds) is extraordinarily in favor of "god." Therefore, all else being equal (i.e., if the Prior Odds are 1/1), the Final Odds on the existence of god are enormous, and atheism is refuted. This is correct as to the logic of it, and Bayes' Theorem explains why, but it is incorrect as to its premises. Evidence is being left out; and when it is reintroduced, the conclusion *reverses*. Bayes' Theorem, once again, explains why.

To test two hypotheses against each other, one must assess all pertinent evidence *e*, everything each hypothesis predicts.[10] In this case the "luck" hypothesis requires an extraordinarily improbable event: biogenesis, i.e., that a self-replicating molecule would be randomly assembled in the universe by chance accident. The only way that can be probable is if there were an extraordinary number of random events of molecular mixing—like the lottery: any single win is improbable, but there are so many tickets bought that the odds that the lottery *will be won* are essentially 100%. And so we observe it to be: lotteries are routinely won. And in cosmology the only way this can be the case is if the universe is extraordinarily old, extraordinarily large, extraordinarily full of random molecular mixing, and yet also extraordinarily *lacking* places hospitable to life (since an accidentally assembled universe would produce those, as well, only by chance accident). But *that* is surprising on the "god" hypothesis; yet is 100% expected on atheism—in fact, this is the only kind of universe we could observe on atheism, because without gods, only such universes could produce observers to any credible probability. This means nearly all godless universes observed will be extraordinarily large, extraordinarily old, extraordinarily full of material, and extraordinarily inhospitable to life. For example, nearly all of this universe is a lethal radiation-filled vacuum; and almost all that is in it apart from that consists of stars and black holes, which are absolutely lethal to life; and next after that is almost all dead rocks and lethal atmospheres. In fact, almost nothing in this universe is a suitable place for life to arise and evolve. This is exactly what one expects to see—in fact, in all probability, what one would have to see—on atheism. But it is not at all what one expects to see on theism. So why would a god make the universe look exactly like a universe with no god in it? Any answer one gives to that question remains an unevidenced assumption to which an improbability attaches, an improbability that commutes to their conclusion, as previously demonstrated. Ockham's Razor strikes again.

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[10] Sober, "The Design Argument" 117–48; Ikeda and Jefferys, "The Anthropic Principle" 150–66; Carrier, "Neither Life Nor the Universe," 279–304.

Fine-tuning is, therefore, a property all godless universes will be observed to have (it is impossible to have atheists *other than* in a godlessly fine-tuned universe—since universes that cannot produce observers will never be observed), which means the probability we would observe fine-tuning on the "luck" hypothesis is 100%. Since theism can never make this evidence "more" likely than 100%, fine-tuning can never be evidence for theism. The evidence theists are leaving out (the vast size, age, content, and lethality of the universe) drops the probability of this universe being observed on the "god" hypothesis *below* its probability on atheism. God has no need of fine-tuning—he can make universes work without it—and without any absurd size, age, content, or lethality. Only godless universes require that. Fine-tuning is therefore evidence *for atheism*.

The only available response is to concede the point, and insist this only moves the question back to the Prior Odds, where atheists have to assume an extraordinarily lucky event: the one universe that just randomly came to be, just happened to be one of the rarest kinds—one that would produce observers. But logically, this supplies no actual rebuttal because the probabilities in Bayesian argument are always in ratio. What matters is not how improbable something is, but how much more or less probable it is than something else. And here the theist's contrary hypothesis is resting on *essentially the same improbability*: that we just happened to be so incredibly lucky as for there to be a god—a super-powered, disembodied mind of the greatest genius and knowledge and thus greatest informational complexity, the most improbable of entities—who also just happened to want to create a messy, deadly, absurdly large, old, and junk-filled universe that would eventually randomly produce a few people in it, a universe that would look, bizarrely, exactly like a universe would have to look if there were no god at all. Things appear to be a wash on this point: the atheist rests on no greater a chance accident here than the theist does. Fine-tuned god or fine-tuned universe—neither is more likely than the other.

Arguably the atheist is even proposing a much more likely accident. Though it is not necessary to demonstrate that here, for even at equal odds the point is secured; nevertheless, there are two respects in which this is the case. First, an infinite mind entails infinite specified complexity, as well as such improbably lucky facts as "disembodied minds are possible." Of all the "things" you can get by random chance, an infinitely complex god is the least likely of them, the more so if it requires an improbably convenient physics. By contrast, the mere fine-tuning of a few physical constants can produce an observer-generating universe to a much lower finite probability. Second, fine-tuning is more likely on atheism than theism by the same reasoning applied to biogenesis. Where atheism entails biogenesis is most likely to be observed if there is an enormous amount of molecular mixing (hence we expect, and behold, a vastly old, large, littered universe), atheism also entails fine-tuning is most likely to be observed if there is a multiverse, i.e., if our universe is just one of countless randomly configured universes. This is the lottery again: if there are countless randomly generated universes, the probability of a universe like ours approaches 100% no matter how finely tuned it is.

Atheism therefore predicts it is likely we would accumulate evidence supporting the existence of a multiverse; and lo, cosmological science is converging on exactly that conclusion: multiverses are the inevitable outcome of an extremely few simple physical facts, facts that observations currently make likely.[11] This is an unexpected outcome on theism (ergo, improbable) but a highly expected outcome on atheism (ergo, probable), which is another disparity entailing an Evidential Odds favoring atheism, not theism. For all the reasons outlined above, fine-tuning is stronger evidence for a multiverse than for a god. The one follows inevitably from a few simple facts now known to be likely; the other does not.

Every Other Argument

Every argument for god meets the same outcome.[12] Apart from always being rendered unsound on the basis of some equivocation fallacy, the Ontological Argument actually just reduces to testing competing hypotheses as to what is most likely the necessary underlying substrate of everything; and insofar as any such thing is necessary, observational evidence more strongly supports simple godless substrates (e.g., spacetime) than extremely complex, ontologically baseless ones (e.g., bodiless super-spirits). Again, the argument proceeds only by omitting evidence, in this case of simpler alternatives that meet all necessary requirements. For example, you cannot have anything more fundamental than spacetime: that which "never exists" and "nowhere exists" does not exist; ergo, everything needs a place and time to exist; except places and times themselves: spacetime is therefore the only known entity capable of being self-existent. Why, then, do we need another? Ockham's Razor strikes.

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[11] See for example, Davies, "Multiverse Cosmological Models" 727–43; Carroll, *From Eternity to Here*; and Stewart, *God and Cosmology*.

[12] See Koterski and Oppy, *Theism and Atheism*; Murray, *Atheist's Primer*; Carrier, *Sense and Goodness*.

The Argument from Religious Experience ("I experience my god; therefore, my god exists") similarly operates by the omission of evidence: all contrary religious experiences, across space and time. When one puts that evidence back in, one finds there are generally two competing hypotheses: that religious experience is a product of human psychology and culture (and thus will vary in accordance with human knowledge and cultural change) or actual contact or communication with a god (and thus will have remained consistent across the entire globe over tens of thousands of years). The psychocultural hypothesis predicts that the gods "contacted" will wildly differ in all their content (moral, existential, theological), that many religious experiences will even lack gods (Taoism, Buddhism, Scientology), and that these will all change across history and cultures. The "god" hypothesis does not predict any of that to be the case. The total evidence is therefore 100% expected if there is no god; but less than 100% expected if there is. Religious experience is therefore *evidence for atheism*, not theism.[13]

Likewise the Argument from Consciousness (that thought would be dependent on a complex, vulnerable, fallible, resource-wasting brain is required if there is no god, but nearly inexplicable if there is), the Argument from Miracles (as already noted with respect to the conveniently perfect disparity between the reliable and non-reliable observation databases, which is exactly what we expect on atheism, but not on theism), the Moral Argument (that morals would evolve over time to increasingly meet human social needs through human innovation, trial, and error is exactly what we expect on atheism, but not what we expect to observe on theism, which sooner predicts perfect morals communicated from the start, as well as a universe governed by moral laws, rather than a wholly indifferent amoral physics), the Argument from Meaning (that humans are mortal and must, and have only, found diverse meaning in their lives on their own, is what we expect on atheism, and not on theism), and so on. Even the Argument from Evil is really a reversal of any Design Argument (of which the Fine Tuning Argument is just one instance), because it consists of reintroducing omitted evidence regarding the design of the world, and then applying Ockham's Razor to the overall result.[14] In every case, the theist is putting forward a Bayesian argument (some "evidence" they claim is more likely if a god exists is supposed to entail that the existence of a god is more likely), and in every case, reintroducing the evidence that the theist left out produces the opposite conclusion. This is the power of a Bayesian analysis of logical arguments.

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[13] This is most thoroughly demonstrated in Dennett, *Breaking the Spell*.

Conclusion

A decent understanding of Bayes' Theorem can equip one to identify when an argument for any conclusion of fact is logically sound and why; or if not, why. This extends even to general principles, like "extraordinary claims require extraordinary evidence," arguments from silence, and Ockham's Razor. And brought to bear on arguments for god, it unravels each one: Bayesian reasoning explains why "excuse making" to "explain away" all the evidence rendering a god unlikely is logically invalid (by revealing the hidden premises about probability that such devices require ignoring); and how reintroducing all the evidence that theists leave out of any argument, reverses that same argument into a solid case against any respectable probability of the existence of a god. This renders Bayesian reasoning a powerful tool in the philosophy of religion, as it has proved to be in so many other fields.[15]

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[14] See Sterba, *Good God Logically Possible*; Trakakis, *God Beyond Belief*; and Howard-Snyder, *Evidential Argument*.

[15] For more on that point see, Mcgrayne, *Theory That Would Not Die*; and Silver, *Signal and the Noise*.

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Richard Carrier is the author of *Sense and Goodness without God* (AuthorHouse 2005), *On the Historicity of Jesus* (Sheffield-Phoenix 2014), *The Scientist in the Early Roman Empire* (Pitchstone 2017), and many other books, chapters, lectures, and articles, including peer-reviewed work in philosophy and the history of Christianity. As an independent scholar he teaches online courses in philosophy and history and regularly publishes articles on his namesake blog richardcarrier.info. He holds a B.A. in history with a minor in classical civilizations from U.C. Berkeley, and an M.A., M.Phil., and Ph.D. in ancient intellectual history from Columbia University. He is a fellow of the Westar Institute and a current member of the Society of Biblical Literature and the Global Center for Religious Research. He specializes in the modern philosophy of naturalism, the origins of Christianity, and the intellectual history of Greece and Rome, and is a veteran of the United States Coast Guard.

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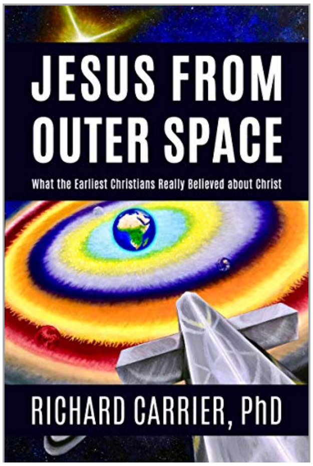

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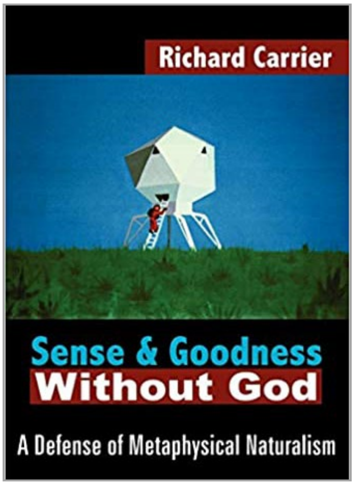
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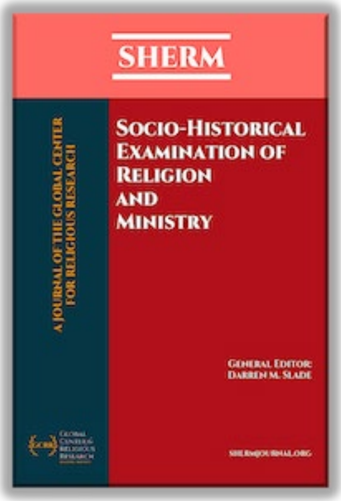
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